

QUANTUM GATE FOR CARRYING OUT A GROVER'S QUANTUM  
ALGORITHM AND A RELATIVE METHOD OF PERFORMING THE  
INTERFERENCE OPERATION OF A GROVER'S QUANTUM ALGORITHM

Abstract of the Disclosure

A quantum gate for running a Grover's quantum algorithm using a binary function having a vector basis of  $n$  qubits is provided. The quantum gate includes a superposition subsystem, an entanglement subsystem and an interference subsystem. The interference subsystem performs an interference operation on components of entanglement vectors for generating components of output vectors. The interference subsystem performs the interference operation in a very fast manner by using an adder receiving as input signals representing even or odd components of an entanglement vector, and generating a sum signal representing a weighted sum with a scale factor of the even or odd components. The interference subsystem also includes an array of adders each input with a respective signal representative of an even or odd component of an entanglement vector and with the weighted sum signal, and generates a signal representative of an even or odd component of an output vector as a difference between the weighted sum signal and the signal representing an even or odd component of an entanglement vector.